

NUTRITIONAL REQUIREMENT OF DIFFERENT AGE GROUPS

BASIC CONCEPTS

- Human nutrition concerned mainly with **Promotion, Protection, and Maintenance of health** in all groups of population.
- The purpose of which is to assess the adequacy of diets for growth of infants, children, adolescents, maintenance of adults health, during pregnancy, and lactation of mothers.

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BASIC CONCEPTS

- **RDAs or Recommended Dietary Allowances** are the average daily dietary intake level that is considered sufficient to meet the nutrient requirements of nearly all (97–98%) of healthy individuals in each age and gender group.
- The **most widely used and accepted** level is Recommended Daily/Dietary Allowance.
- It is also the **standard of nutritional intakes** in normal condition but not in sickness.

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BASIC CONCEPTS

- **AIs or Adequate Intakes** are used when RDAs cannot be determined. They are approximations or estimates of nutrient intake by a group of healthy people assumed to be adequate.
- **UL or Tolerable Upper Limits** are the maximum daily intake unlikely to result in adverse health effects. These vary by age and gender, and specific health conditions can greatly affect needs.

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MEASUREMENTS OF ENERGY

- The energy from is measured in Kilo-calorie or sometime in Joules. The Kilocalorie is generally can also converted in joules.
 - **1000 cal. = 1 kcal = 4184 Joules = 4.184 KJ** (Calorie unit energy).
 - 1 gm. of protein = 4 kcal.
 - 1 gm. of Fat = 9 kcal.
 - 1 gm. of carbohydrate = 4 kcal.

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REFERENCE MAN AND REFERENCE WOMAN

- The energy intake recommendation for an Indian man is “reference man” and energy intake recommendation for an Indian woman is “reference woman” and whose profile is described as follows.

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**REFERENCE
MAN IN INDIA**

He is 20–39 yrs old; free from disease, physically fit for active work. He bears 60 kg weight. He is employed for 8 hrs of moderate work with 4-6 hrs of idle work and 2 hrs recreations or household duties.

**REFERENCE
WOMAN IN INDIA**

She is 20 – 39 years old healthy and she bears 50 kg weight. She may be engaged in 8 hrs of household work or in light industry with 4-6 hrs of idle work and 2 hrs recreations.

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ENERGY REQUIREMENT

- The energy requirement of an individual might be defined as those levels of energy intake in relation to expenditure which is least likely to result in obesity or heart disease or which is most likely to prolong active life.

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ENERGY REQUIREMENT

Broadly total energy requirement of an individual is made up of three components:

- Energy requirement for basal metabolism: 1 kcal/kg body wt/hour for an adult.
- Energy required for daily activities such as walking, sitting, standing, climbing stairs etc.
- Energy required for occupational works: Light (official), Moderate and Heavy (manually operated) works.

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**FACTORS AFFECTING
ENERGY REQUIREMENT**

- Many factors affect this requirement such as age, sex, working situation, body condition, physical activity and works.
- Vulnerable group: pregnant and lactating mothers, infants and children, adolescence, adults.
- Pregnant women requires additional 300 kcal daily and lactating mother requires additional 550 kcal daily for first 6 months and additional 400 kcal daily during next six months of lactating period.

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**FACTORS AFFECTING
ENERGY REQUIREMENT**

- Growing children requires proportionally more energy than adults.
- Energy requirements for adults depend on physical activity.
- After the age of 40 years the energy requirement should be reduced by 5% per decade until the age of 60 and by 10% for each decade thereafter.

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ENERGY REQUIREMENT

Group	Age	Body Wt. (Kg.)	RDA (Kcal/day)
Infancy	0-6 months	-	118 /kg
	7-12 months	-	108 /kg
Children	1-3 yrs.	12	1240
	4-6 yrs.	18	1690
	7-9 yrs.	26	1950

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ENERGY REQUIREMENT

Adolescents	10-12 years M	35.5	2190
	10-12 years F	31.5	1970
	13-15 years M	47.8	2450
	13-15 years F	46.7	2060
	16-18 years M	57	2640
	16-18 years F	49.9	2060

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ENERGY REQUIREMENT

Adult Male	Light work	60	2425
	Moderate work	60	2875
	Heavy work	60	3800
Adult Female	Light work	50	1875
	Moderate work	50	2225
	Heavy work	50	2925
Pregnancy	Pregnancy	-	+ 300
Lactation	First 6months	-	+550
	6-12 months	-	+400

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PROTEIN REQUIREMENTS

- The requirement of protein for each individual differs on the basis of various factors like age, sex, physiological activities and the infection, worm infestation and the emotional disturbances.
- The protein requirement is calculated in two ways: Protein Quality and Protein Quantity.

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PROTEIN QUALITY

- Protein Quality:** The quality of protein is assessed by comparing the reference protein which is usually egg protein. It is done by two methods i.e. amino acid score and net protein utilization (NPU).

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AMINO ACID SCORE

- Amino Acid Score:** It is the measure of concentration of each essential amino acid in the food and expressed in percentage with reference protein i.e.

$$\text{Amino acid score} = \frac{\text{Number of mg of one amino acid per gram of protein}}{\text{Number of mg of the same amino acid per gram of egg protein}} \times 100$$

The average score is about 50 to 60% in starches and 70 to 80% in animal foods.

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NET PROTEIN UTILIZATION

- Net Protein Utilization (NPU):** It is the product of digestibility coefficient and biological value and multiplied by 100. It expresses in more convenient way than amino acid score. The calculation of NPU requires special laboratory facilities.

$$\text{NPU} = \frac{\text{Nitrogen retained by the body}}{\text{Nitrogen intake}} \times 100$$

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NET PROTEIN UTILIZATION

- In an average, 1 gram of protein is equivalent of 6.25 gram of nitrogen.
- If NPU is low then the protein requirement is high. The average NPU of is about 50 to 80%

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PROTEIN QUANTITY

- **Protein Quantity:** The protein contain of many food has been identified and published. One way of evaluating food as a source of protein is to determine what percent of their energy value is supplied by their protein contains. This is known as Protein energy Ratio and expressed in %.

$$\text{Protein Energy Ratio (\%)} = \frac{\text{Energy from protein}}{\text{Total energy in diet}} \times 100$$

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PROTEIN ENERGY RATIO

Group	Recommended protein intake g/day	Recommended energy intake kcal/day	PE Ratio (%)
Man*	60	2900	8.3
Woman*	50	2200	9.1
Pregnant	65	2500	10.4
Lactating	75	2750	10.9

*Reference adult for moderate activity

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PROTEIN ENERGY RATIO

Preschool children			
1-3 yrs.	21	1240	6.8
4-6 yrs.	29	1690	6.9
7-9 yrs.	40	1950	8.2
Adolescents			
13-15 yrs. Boys	67	2450	10.9
Girls	62	2060	12.0
16-18 yrs. Boys	75	2640	11.4
Girls	60	2060	11.7

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Relative Protein Value of some foods: % of total energy supplied by protein

Food	Nutrients per 100 gm		Energy form protein	
	Kcal	Protein (gram)	Actual (kcal)	PE%
Fish	100	20	80	80
Cow milk	67	3.2	13	20
Rice	350	21	84	24
Dhal	350	7	28	8
Potato	100	1.6	6	6
Banana	100	1	4	4
Tapioca	160	0.7	3	2

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FAT REQUIREMENT

- The daily requirement of fat is not known with certainty.
- During infancy, fats contribute to a little over 50% of total daily energy intake.
- This scale down to **20%** in adulthood. Recommended fat intake is about 20% of total energy intake; of which 50% must be unsaturated fats i.e. vegetables oils rich in essential fatty acids.

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SUGGESTED DAILY INTAKE OF DIETARY FATS

Particulars	Fat intake		Essential fatty acids energy %
	Gram/Day	Energy %	
Adults: Male and Female	20*	9.0	3.0
Pregnant women	30	12.5	4.5
Lactating mother	45	17.5	5.7
Older children	22	9.0	3.0
Young children	25	15.0	3.0

*about half of this fat will come from invisible fat present in the foods.

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CARBOHYDRATE REQUIREMENT

- The recommended intake of carbohydrate in balanced diet is **between 50-70%** of total energy intake.
- South East Asian diet contains carbohydrates as much as 90% of total energy in takes, which make diet imbalance yielding various consequences.
- Recommended daily energy intake is given in the above table in energy requirement.

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REQUIREMENT OF OTHER NUTRIENTS

- Requirements of other nutrients including vitamins and minerals are given in the separate table.
- The recommended dietary allowance of vitamin E is placed 10 mg of alpha tocopherol equivalent for adult males and 8 gram for adult females.

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SUMMARY OF RECOMMENDED DAILY DIETARY ALLOWANCES (RDA)

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Group	Particulars	Body wt Kg	Net energy Kcal/day	Protein g/d	Fat g/d	Calcium Mg/d	Iron Mg/d	Vitamin A g/d	Vitamin B ₁ mg/d	Vitamin B ₂ mg/d	Vitamin C mg/d	Vitamin E mg/d	Vitamin K mg/d	Vitamin P mg/d	Vitamin B ₆ mg/d	Vitamin B ₁₂ mg/d	Vitamin D mg/d
Man	Sedentary	60	2425	60	20	400	28	600	2400	1.2	1.4	16	2.0	40	100	1	
	Moderate		2875							1.4	1.6	18					
	Heavy		3000							1.6	1.9	21					
Woman	Sedentary	50	1875	50	20	400	30	600	2400	0.9	1.1	12	2.0	40	100	1	
	Moderate		2225							1.1	1.3	14					
	Heavy		2925							1.2	1.5	16					
Pregnant	P.nancy	50	+300	+15	30	1000	38	600	2400	+0.2	+0.2	+2	2.5	40	400	1	
Lactation	0-6mths	50	+550	+25	45	1000	30	950	3800	+0.3	+3	+4	2.5	80	150	1.5	
	6-12mths		+400	+18						+0.2	+0.2	+3					
Infants	0-6 mths	5.4	108/kg	2.05/kg	--	--	--	350	1200	50mg/kg	60mg/kg	710mg/kg	0.1	25	25	0.2	
	6-12 mths	8.6	98/kg	1.65/kg	--	--	--			50mg/kg	60mg/kg	650mg/kg	0.4				
	1-3 yrs	12.2	1240	22				12	400	1600	0.6	0.7	8	40	30		
Children	4-6 yrs	19.0	1680	30	25	400	18	400	1600	0.9	1.0	11	0.9			0.2	
	7-9 yrs	26.9	1950	41			26	600	2400	1.0	1.2	13	1.5			40	1.0
	10-12 yrs	35.4	2190	54			34			1.1	1.3	15				60	
Boys	10-12 yrs	31.5	1970	57	22	600	19	600	2400	1.0	1.2	13	1.6	40	70	0.2	1.0
Girls	10-12 yrs	31.5	1970	57	22	600	19	600	2400	1.0	1.2	13	1.6	40	70	0.2	1.0
Boys	13-15 yrs	47.8	2450	76			41	600	2400	1.2	1.5	16	2.0	40	100	0.2	1.0
Girls	13-15 yrs	46.7	2060	65			28	600	2400	1.0	1.2	14					
Boys	16-18 yrs	57.1	2640	78	22	500	50	600	2400	1.3	1.6	17	2.0	40	100	0.2	1.0
Girls	16-18 yrs	49.9	2060	63			30			1.0	1.2	14					

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NUTRITIONAL REQUIREMENTS FOR VULNERABLE GROUPS

NUTRITIONAL REQUIREMENT

- Some groups in our communities are more likely to lack a balance diet and to suffer from malnutrition. These are called the vulnerable groups.
- Vulnerable groups who need special attention with regard to nutrition are described with separate headings.

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NUTRITIONAL REQUIREMENT

- Infants: Birth to one Year.
- Children: 1-3 yrs.
- Children: 4-6 yrs.
- School children and adolescents.
- Pregnant and lactating mothers.
- Old people.
- The sick, who need a modified diet.

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NUTRITIONAL REQUIREMENTS OF INFANTS

INFANTS

Infants		Group	Particulars
6-12 mths	0-6 mths		Body wt in Kg
8.6	5.4		Net energy Kcal/day
98/kg	108/kg		Protein g/d
1.65/kg	2.05/kg		Fat g/d
---	---		Calcium Mg/d
---	---		Iron Mg/d
---	---		Retinol Vitamin A g/d
---	---		B-carotene B-carotene Mg/d
50mg/kg	55mg/kg		Thiamin
60mg/kg	65mg/kg		Riboflavin
650mg/kg	710mg/kg		Nicotinic acid
0.4	0.1		Pyridoxine
---	---		Ascorbic acid
---	---		Folic acid
---	---		Vitamin B12

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INFANTS FEEDING

- No prelactal feeding
- Initiation of breast feeding within 1 hour of birth
- Exclusive breast feeding up to six months
- Weaning at 6 months of age.
- Supplementary food must be safe, soft, appropriate and adequate.
- Continuation of breast feeding at least up to 2 years of age.

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NUTRITIONAL REQUIREMENT OF CHILDREN

Nutritional Requirement of Children

Children		Group	
7-9 yrs	4-6 yrs	1-3 yrs	Particulars
26.9	19.0	12.2	Body wt in Kg
1950	1690	1240	Net energy Kcal/day
41	30	22	Protein g/d
25			Fat g/d
400			Calcium Mg/d
26	18	12	Iron Mg/d
600	400	400	Retinol
2400	1600		B-carotene
1.0	0.9	0.6	Thiamin Mg/d
1.2	1.0	0.7	Riboflavin Mg/d
13	11	8	Nicotinic acid mg/d
1.6	0.9		Pyridoxine mg/d
40			Ascorbic acid Mg/d
60	40	30	Folic acid
0.2-1.0			Vitamin B12Mg/d

CHILDREN 1-3 YEARS



- Energy requirements increase because children are active and growing rapidly.
- There is an increased need for all the vitamins, except vitamin D.
- Slightly lower amounts of calcium, phosphorous and iron are needed.
- There is an increased requirement for all the other minerals except for zinc.
- In the second year of life children continue to need energy-dense diets.

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CHILDREN 1-3 YEARS

- They should be given whole milk, not skimmed or semi skimmed, and care needs to be taken over the amount of fiber eaten.
- If the diet is too bulky due to too many high fiber foods, there is a danger the child will be unable to eat enough food to satisfy its energy needs.
- After the age of 2 years, semi-skimmed milk may be given provided adequate energy intake is assured.

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CHILDREN 1-3 YEARS

- Toddlers need about 1200 Kcal per day.

A Day requirement

- 150 gm staple foods. (at last two kinds & Serve 3 times a day)
- 200 ml. milk. (vegetarians need extra 100 ml.)
- 30 gm. egg, fish or meat
- 40 gm Dark Green leafy vegetables
- 30 gm sugar or Jaggery
- 20 gm oil,
- 30 gm of other vegetables
- 50 gm of Fruits.

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4-6 YEARS (PRESCHOOL CHILD)

- Energy requirements continue to increase and there is a greater need for protein, all the vitamins (except C and D) and all the minerals (except iron).
- The figure for vitamin C remains the same as for younger children.
- No value is given for vitamin D since the action of sunlight on the child's skin will now be the major source of this vitamin.

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4-6 YEARS (PRESCHOOL CHILD)

- Children in this age group need special attention they show a good deal of physical activity and growth. So they need extra protein vitamins and minerals.
- They need about 1500 calories per day, with requirements of following.

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MIDDAY MEAL FOR SCHOOL CHILDREN (6-15 YEARS)

- In this age protein caloric deficiency and vitamins deficiency are frequent.
- They need to have a good breakfast and to have a balanced midday meal at school.
- In the evening they again need to have a well balanced meal with the family.
- They need one or two snacks during the day.
- If a mid day meal is not provided at school, the child should be given packed meal to take to school.

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PRINCIPLE INVOLVED IN ORGANIZING A SCHOOL MEAL PROGRAM

- The meal should be **supplement and not a substitute to the home diet.**
- The meal should supply at **least 1/3 of total daily calorie and 1/2 of the protein requirement.**
- Cost of meal should be **reasonably low.**
- The meal should be prepared easily in school.
- **Locally available** foods should be used.
- The menu should be **frequently changed** to avoid monotony.

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MIDDAY MEAL FOR SCHOOL CHILDREN (6-15 YEARS)

A child who is hungry will not be able to learn.

A Balanced midday meal:

- Cereals such as rice or wheat: 75 gm per day per child.
- Pulses such as dhal or beans: 30 gm per day per child.
- Dark Green leafy vegetables: 30 gm per day per child.
- Other vegetables: 30 gm per day per child.
- Oil: 8 gm per day per child.

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16-18 YEARS

- **Boys:** Energy and protein requirements continue to increase as do the requirements of a number of vitamins i.e. thiamin, riboflavin, niacin, vitamins B6, B12, C and A; and magnesium, potassium, zinc, copper, selenium and iodine.

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16-18 YEARS

- **Girls:** Requirements for energy, protein, thiamin, niacin, vitamins B6, B12 and C, phosphorus, magnesium, potassium, copper, selenium and iodine all increase.
- Boys and girls have the same requirement for vitamin B12, folate, vitamin C, magnesium, sodium, potassium, chloride and copper.
- Girls have a higher requirement than boys for iron (due to menstrual losses) but a lower requirement for zinc.

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ADULTS (19-50 YEARS):

- In comparison to adolescents, energy requirements are lower for both men and women as are requirements for calcium and phosphorus.
- There is also a reduced requirement in women for magnesium, and in men for iron.
- The requirements for protein and most of the vitamins and minerals remain virtually unchanged.

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Woman		Man		Group Particulars
Heavy	Moderate	Heavy	Moderate	
2025	2225	2875	2425	Body wt in Kg
50	1875	60	2425	Net energy Kcal/day
50		60		Protein g/d
20		20		Fat g/d
400		400		Calcium Mg/d
30		28		Iron Mg/d
600		600		Retinol A g/d
2400		2400		B-carotene
1.2	1.1	0.9	1.6	Thiamin Mg/d
1.5	1.3	1.1	1.9	Riboflavin Mg/d
16	14	12	21	Nicotinic acid mg/d
				Pyridoxine mg/d
				Ascorbic acid Mg/d
				Folic acid Mg/d
				Vit B12 Mg/d

NUTRITIONAL REQUIREMENT OF PREGNANT WOMEN AND LACTATING MOTHERS

Lactation		Pregnancy		Group Particulars
0-12mths	13-6mths	Pregnancy	Pregnancy	
50	+550	50	+300	Body wt in Kg
+18	+25	+15	+15	Net energy Kcal/day
45		30		Protein g/d
1000		1000		Fat g/d
		38		Calcium Mg/d
950		600		Iron Mg/d
3800		2400		Retinol A g/d
+0.2	+0.3	+0.2	+0.2	B-carotene
+0.2	+3	+0.2	+0.2	Thiamin Mg/d
+3	+4	+2	+2	Riboflavin Mg/d
				Nicotinic acid mg/d
				Pyridoxine mg/d
				Ascorbic acid Mg/d
				Folic acid Mg/d
				Vitamin B12 Mg/d

PREGNANCY

- During pregnancy, there are increased requirements for some, but not all, nutrients.
- Women intending to become pregnant and for the first 12 weeks of pregnancy are advised to take supplements of folic acid to help reduce the risk of their child having a neural tube defect.

PREGNANCY

- In addition, all women of child bearing age are advised to eat adequate amounts of iron and folate.
- Additional energy and thiamin are only required during the last three months of pregnancy.
- Mineral requirements do not increase.

SELECTION OF FOODS DURING PREGNANCY

- During first 3 months of normal pregnancy the diet need not be different from the average normal diet for women.
- After the 3 months the foods should be selected in such a way that all essential nutrients are supplied in proper amounts.

SELECTION OF FOODS DURING PREGNANCY

The following foods are including daily in the meal plan:

- 30 gm sugar or jaggery.
- 600 gm milk
- 120 gm meat, fish or 2 serving dhal.
- 4 serving vegetables and ghee.
- 3 serving whole grain cereals.
- 2 serving fruits, nuts.

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Meal Plan during pregnancy as example

Time	Particulars
Break fast	100 ml of milk. Egg - 1. Cereals preparation, e.g.: 2 idli. Fruit - 1.
10 AM	Milk 100 ml. Nuts 25 gm.
Lunch	Rice 120 gm. Mutton 60 gm (or alternative). Vegetables and greens. Curds 100 ml. Dhal sambar.
3 PM	Milk 100 ml (in coffee or tea). Fruit 1. Nuts 25 gm.
7 PM	Same as lunch Chapattis 4.
9 PM	(Supper) vegetables and greens. Milk 200 gm

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PREGNANCY

- A minimum of 25 grams of oil should be used in cooking per day.
- Liver should be taken once or twice a week.
- For vegetarian dhal and grains can be used in place of meat and an increased amount of milk should be used.
- If the family can't effort large amount of milk, ground can be recommended.
- These can be used as chutney.
- Green leafy vegetables, Yellow vegetables, raw tomatoes, citrus fruits like lemon, oranges and gooseberry can be used papaya, guava also used.

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LACTATION

- During lactation, there is an increased requirement for energy, protein, all the vitamins (except B6), calcium, phosphorus, magnesium, zinc, copper and selenium.

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LACTATION

SELECTION OF FOOD DURING LACTATION:

- Immediately after delivery mother requires adequate rest.
- She can develop a good appetite during this period.
- She can give normal regular meal or light meal. Later the selection of foods during the lactation is basically same as that during pregnancy except for the daily addition of:
- 500 ml. of milk.
- 30 gm mutton or 15 gm dhal.
- Fruit (citrus one).

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Diet for pregnant and Lactating Women

Staple Food	Lactating Veg. gm/day.	Woman Non-veg.gm/day.
Cereals-in 3 meals (include ragi or bajra).	500	475
Extra Proteins		
Pulses - 2 servings	100	50
Nuts or sesame seeds	100	80
Meat, fish or egg	-----	100
Milk or curds	800	650
Protective foods	100	100
Dark Green leafy Vegetables		
Other vegetables	75	75
Fruits	60	60
Extra Energy Foods		
Fats and oils	75	45
Sugar and jaggery	30	30

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Diet for pregnant and Lactating Women

- If a pregnant or lactating woman is pure vegetarian or cannot afford to have milk, she should be encouraged to:
- Increase the pulses in her diet.
- Eat a handful of groundnuts daily.
- Drink milk made from ragi malt, groundnuts or soybeans.

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A day menu: as example

- **6 AM:** Fresh fruit such as banana, guava, tomato, papaya or mango.
- **12 noon:** 75 100 gm well cooked rice or other staple.
1 Boiled and mashed egg or fish or meat or
2 spoons well cooked or mashed dhal.
3-4 spoons boiled dark green leafy vegetables.
1 spoon ghee or oil added and well mixed in the food while hot.
- **3 PM:** Pulses such as Bengal gram 1 handful, milk with sugar or jaggery.
- **7-30 PM** Meals similar to 12 noon meal.

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50+ YEARS:

- Energy requirements decrease gradually after the age of 50 in women and age 60 in men.
- Protein requirements decrease for men but continue to increase slightly in women.
- The requirements for vitamins and minerals remain virtually unchanged for both men and women.

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50+ YEARS:

- There is one exception - after the menopause, women's requirement for iron is reduced to the same level as that for men.
- In addition, after the age of 65 the RDA for vitamin D is 10 µg/day

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Particulars	Vegetarian gm/ day	non - veg. gm/day
Cereals in meals (Including ragi or bajra)	300	300
Pulses	70	70
Ground nuts and sesame seeds	50	30
Milk	500	200
Meat, fish and eggs	--	30
Dark green leafy vegetables	100	100
Other vegetables	30	30
Fats and oils	20	20
Sugar and jaggery	20	20

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